

(No Model.)

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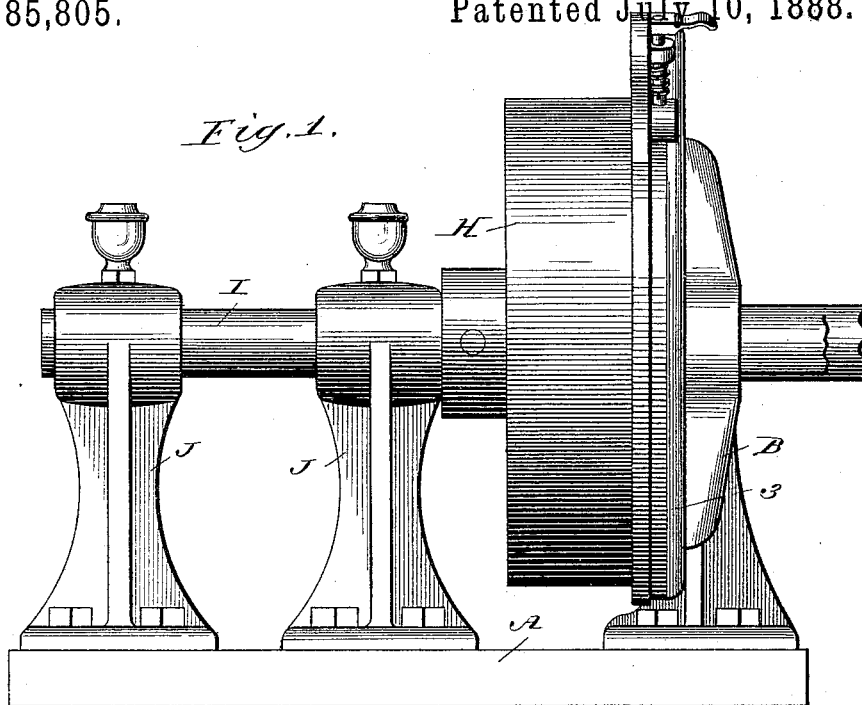
J. A. GREGERSEN & A. G. GRAMNAS.

## ROTARY ENGINE.

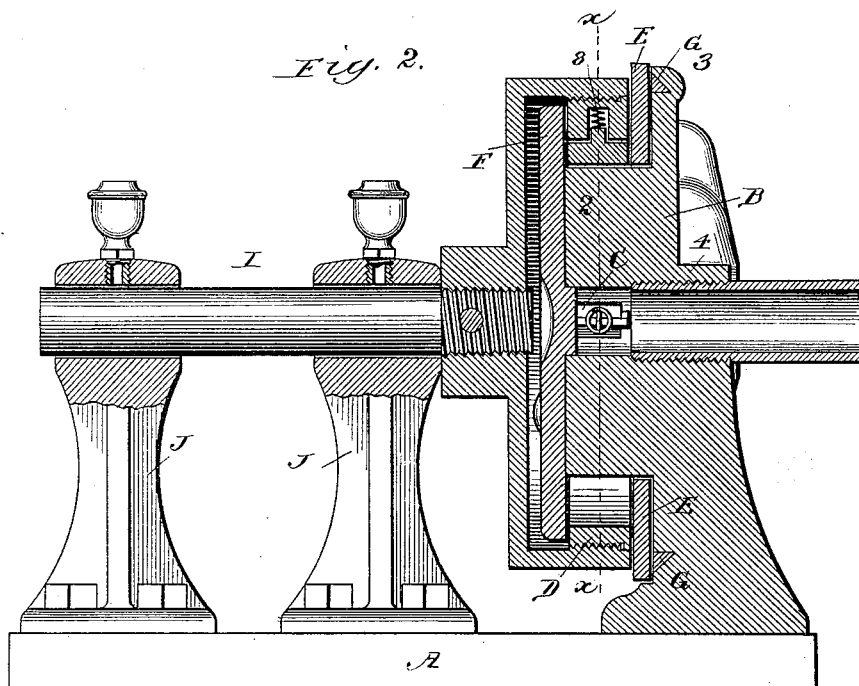
No. 385,805.

Patented July 10, 1888.

*Fig. 1.*



*Fig. 2.*



Witnesses

H. Rosette  
Chlo. Lubbert.

Inventor!  
John A. Gregersen.  
Anton G. Grammas.  
By Wm. B. Lott,  
Att'y.

(No Model.)

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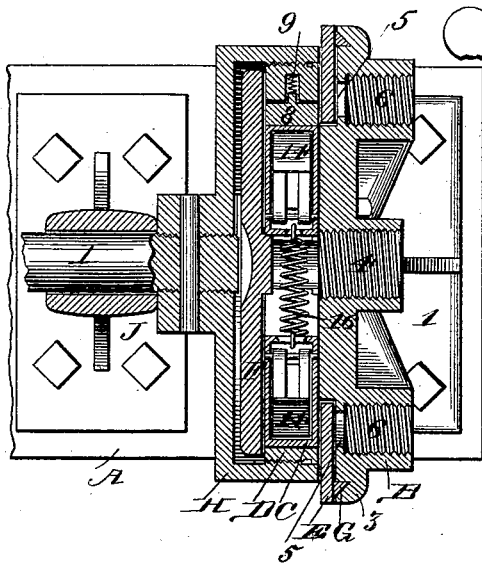
J. A. GREGERSEN & A. G. GRAMNAS.

ROTARY ENGINE.

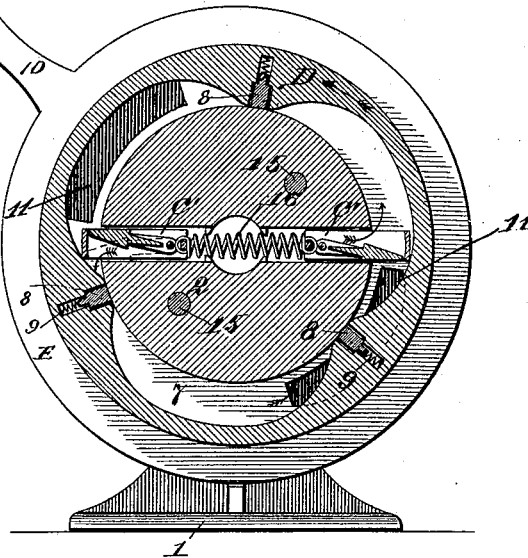
No. 385,805.

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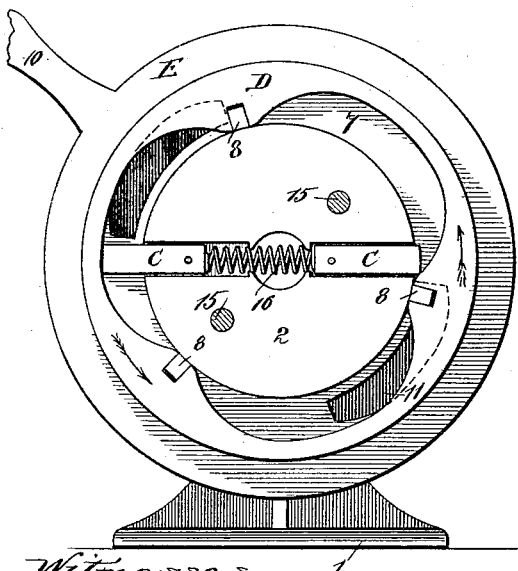
*Fig. 3.*



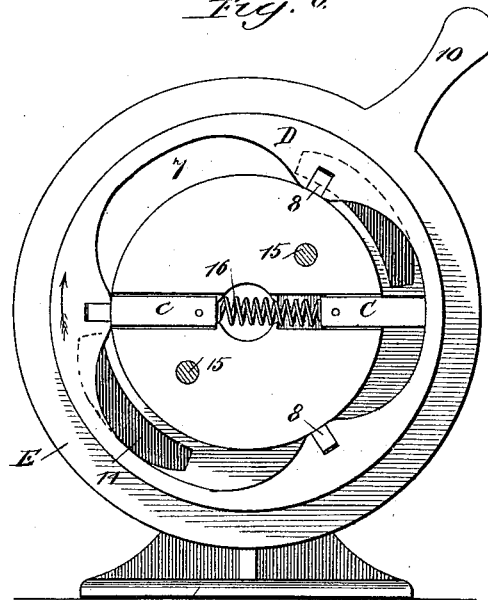
*Fig. 4.*



*Fig. 5.*



*Fig. 6.*



Witnesses.

*V. Rossiter*  
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(No Model.)

3 Sheets—Sheet 3.

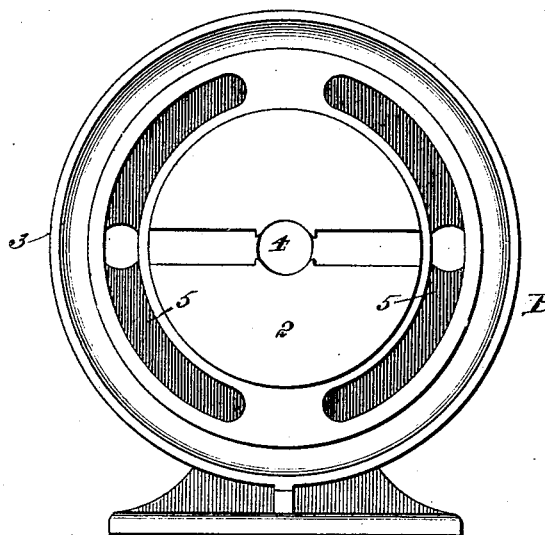
J. A. GREGERSEN & A. G. GRAMNAS.

ROTARY ENGINE.

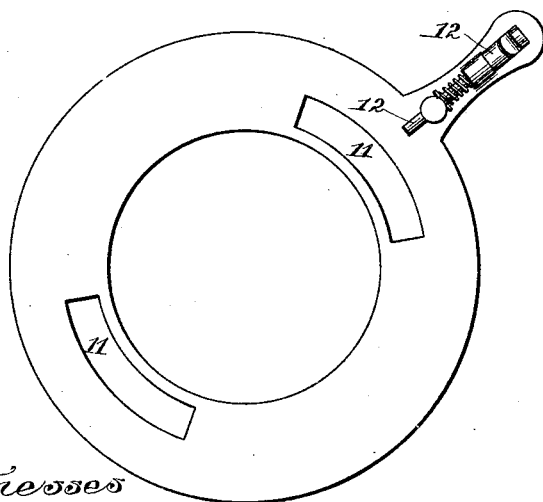
No. 385,805.

Patented July 10, 1888.

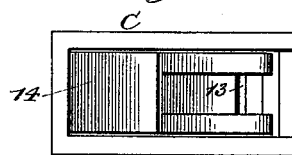
*Fig. 7.*



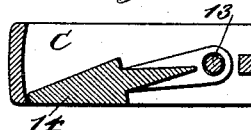
*Fig. 8.*



*Fig. 9.*



*Fig. 10.*



Witnesses

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# UNITED STATES PATENT OFFICE.

JOHN A. GREGERSEN AND ANTON G. GRAMNAS, OF CHICAGO, ILLINOIS.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 385,805, dated July 10, 1888.

Application filed February 11, 1888. Serial No. 263,750. (No model.)

*To all whom it may concern:*

Be it known that we, JOHN A. GREGERSEN, a citizen of the United States of America, and ANTON G. GRAMNAS, a subject of the King of Norway, both residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Rotary Steam-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention has for its object to provide a rotary engine of an improved construction the motion of which can be instantly reversed; and with these objects in view our invention consists of the novel devices and combinations of devices hereinafter described and specifically claimed.

In the accompanying drawings, Figure 1 represents a side elevation of the engine; Fig. 2, a longitudinal vertical section through the center, and Fig. 3 a sectional plan of the same. Fig. 4 is a transverse vertical section on line *x x* in Fig. 2. Figs. 5 and 6 are elevations of the cylinders and pistons exposed and on oppositely-moving positions; Fig. 7, an elevation of the head detached; Fig. 8, an elevation of the reversing-plate detached, and Figs. 9 and 10 a plan and cross-section of one of the abutments detached.

Corresponding referential characters in the several figures of the drawings designate like parts.

A denotes the base-plate of the machine, and B the head with foot 1, which is rigidly secured by bolts upon base A. This head B provides the stationary inner cylinder, 2, forming the center of the same and a flange or annular shoulder, 3, to one side of such cylinder. Through the center of head B is cored the steam-port 4, communicating rearward with a screw-nozzle for coupling the steam-supply pipe, and at both sides of the inner cylinder, 2, the flange 3 has cored two semicircular exhaust-ports, 5, each communicating with a rearward-projecting screw-nozzle, 6, for coupling the exhaust-pipes. The inner cylinder, 2, is grooved diametrically and horizontally through its center to form guideways for the radially-moving abutments C. Upon the inner cylinder, 2, is a sleeve or ring, D, forming the exterior or rotating cylinder for the engine,

journalled upon such inner cylinder, 2. This cylinder D provides three or more bearings upon such inner cylinder at equal distances apart, while intermediate of these bearing-points the cylinder is notched out to form crescent-shaped chambers 7, the difference of radius of which and the inner cylinder, 2, provides the surface for the steam-pressure to act against. These inside faces of the crescent-shaped chambers 7 radially move the abutments C, that butt against the same. The three bearing-points of cylinder D upon stationary cylinder 2 consist of metal gibs 8, fitted into lateral grooves of such cylinder D, each such gib being held in contact with cylinder 2 by a spiral spring, 9, inserted into a socket of cylinder D, whereby any wear from friction is compensated.

E is a ring-shaped plate provided with a handle, 10, and bored to fit upon inner cylinder, 2. This ring-plate E is interposed between flange 3 of head B and cylinder D. Two segmental exhaust-openings, 11, are cut into plate E, that are diametrically opposite each other, and are each only one-third the length of exhaust-ports 5 in head B. The handle 10 of this plate E is provided with a spring-bolt, 12, which will engage either one of two sockets in flange 3 of head B for locking the plate on either one of two positions that will move the openings 11 therein from a position at one side of the abutments C to the opposite side thereof for changing the movement of the cylinder D to rotate in one direction or the other.

The abutments C consist each of a rectangular frame fitted snugly to slide in the diametrical groove of cylinder 2 of head B. Both abutments C are connected by a spiral spring, 16, pushing them apart to hold their ends in close contact with the interior face of cylinder D. Into each frame C is fitted and pivotally connected by a pin, 13, a wedge-shaped valve-plate, 14, the end of which forms a close joint with the interiorly-concaved end wall of the frame while being swung to either one of its two positions where either side will be flush with the respective face of the frame C. Against the forward face of cylinder 2 of head B is rigidly secured by two bolts, 15, a disk, F, the cylinder D rotating between this disk F and reversing-plate E and forming close joints

therewith, and for the purpose of compensating for any wear the flange 3 of head B has turned in its face an annular groove triangular in cross-section, into which is inserted a metal packing-ring, G, slit at one side to form an expansion joint like a piston-ring, which ring G by its elastic expanding force will laterally press against ring plate E, and will thus hold the parts E D F close jointed to each other.

The cylinder D is screw-threaded on its periphery and is screwed into the socket of a flanged wheel, H, and rigidly fixed therein against becoming loose by a pin or screw. This wheel H is mounted upon the overhanging end of shaft I, journaled in standard bearings J, secured upon base-plate A.

Upon shaft I is to be mounted a pulley or gear-wheel for transmitting the power of this motor. Steam being admitted through a pipe coupled with nozzle 4 will enter the guide-groove in cylinder 2 of head B, and thence will pass through the abutments C, and, the valves 14 therein closing one side of each abutment, the steam will pass out from the opposite side thereof, which is also the side opposite to the exhaust-openings 11 in plate E, and will enter the chambers 7 of cylinder D between each abutment C and gib 8, thereby rotating the cylinder D. The steam entering through each valve after thus having acted upon cylinder D by filling one of the chambers 7 until the gib passes the abutment, shutting off further supply of steam to said chamber and about to commence entering the next following chamber 7, the advance gib 8 of the first chamber will be on a line with the exhaust-opening 11 of plate E, which again communicates with exhaust-ports 5 of head B, the steam escaping through a pipe coupled with nozzle 6, and thus each chamber 7 in succession will be twice filled with steam during each revolution of the cylinder D, and, there being three chambers 7 in the cylinder D and only two abutments C in the inner cylinder, one of the chambers 7 must always receive steam, so there will be no dead-center in the motion of the engine. The action of the steam will be understood by reference to the position of the valve-plates 14. Referring to the left hand-plate, as shown in Fig. 4, this plate will of its own gravity fall to the lower side of the abutment as long as no steam is admitted through opening 4; but as soon as steam under pressure is admitted through this opening the current of steam will strike the inwardly-projecting wing of such valve-plate 14. Such portion of the current as passes above such wing will pass freely out of the exhaust-port, while the impulse of the portion of the steam-current which strikes below such wing finds no outlet and will necessarily throw the said valve up and close it in that direction, as shown in said Fig. 4.

The number of chambers as well as the number of abutments may be varied; but it will be necessary that the number of chambers should

be one more than the number of pistons, so that in succession one of the chambers 7 will be always in position to receive steam.

The direction of rotation of cylinder D will be regulated by the position of the exhaust-ports 11 of ring-plate E relative to the position of abutments C, which on one of its two positions will have the exhaust-openings 11 at one side of the abutments C and on its other position at the opposite side of the abutments, and with swinging such plate E from one position to the other, so as to reverse the position of the exhaust-openings 11, the valves 14 will be swung automatically by the pressure of the steam from one face of the abutments C to the face opposite or toward the exhaust-openings, thereby shutting off the steam-escape in that direction and affording an outlet for the steam in the opposite direction to fill the chamber 7 and to exert its force against the end of such chamber 7. This machine can also be made with inner cylinder, 2, and the abutments to rotate and outer cylinder, D, to be stationary, in which case the steam and exhaust ports would have to be in such cylinder D.

What I claim is—

1. An inner stationary cylinder provided with radially-movable abutments, in combination with a rotating outer cylinder and head journaled upon the inner cylinder and provided with crescent-shaped recesses for the abutments to butt against, as set forth.

2. The combination, with a stationary inner cylinder having a flanged head and provided with radially-sliding abutments, of an exterior rotating cylinder and head journaled upon such inner cylinder and having steam-receiving chambers or recesses of unequal number to the number of abutments, as and for the purpose set forth.

3. The head B, having stationary inner cylinder, 2, formed integral therewith, and central steam-inlet, 4, with exhaust-ports 5, said inner cylinder, 2, being slotted, and the radially-sliding abutments C, guided in said slots, in combination with cylinder D, journaled upon such inner cylinder, 2, and having steam-receiving chambers or recesses 7, all substantially as set forth.

4. The head B, having stationary inner cylinder, 2, formed integral therewith and provided with central steam-inlet, 4, and with exhaust-ports 5, in combination with flanged wheel H, cylinder D, secured in wheel H, provided with steam-receiving chambers or recesses 7, and journaled upon cylinder 2, and with abutments C, radially guided in a groove of such cylinder, 2, and pushed apart and in contact with cylinder D by a spring, 16, as set forth.

5. The combination, with rotating cylinder D, provided with chambers 7, of stationary cylinder 2, forming the journal for such cylinder D, having a central steam-inlet, 4, and exhaust-ports 5, and being radially slotted for guiding abutments C, pushed outward by spring 16, each such abutment being provided

with a valve, 14, vibratable to be flush with either face of the abutment for automatically reversing the inlet of steam from one side of the abutment to the other by changing the position of the exhaust-ports, substantially as set forth.

6. The head B, with stationary inner cylinder, 2, with central steam-inlet, 4, with exhaust-ports 5, and with abutments C, guided in radial slots of cylinder 2 and pushed outward by spring 16, and each abutment C provided with a vibratable valve, 14, in combination with cylinder D, journaled upon cylinder 2 and provided with steam-receiving chambers 7, all substantially as set forth.

7. The combination, with head B, having stationary cylinder 2 slotted radially for guiding abutments C, of flanged wheel H and rotating cylinder D, secured in said wheel and having steam-inlet chambers 7, and provided with gibs inserted into slots of such cylinder to furnish the bearings upon such cylinder, and each gib held in contact with such inner cylinder by a spring, 9, all substantially as set forth.

8. The combination of head B, with inner cylinder, 2, slotted radially for abutments C, of disk F, secured against such abutment, and of cylinder D, journaled upon cylinder 2 between flange 3 and disk F, all substantially as set forth.

9. The combination of head B, with inner cylinder, 2, flange 3, central steam-inlet, 4, and exhaust-ports 5, and being provided with abutments C, having valves 14, of cylinder D, provided with steam-chambers 7 and journaled upon inner cylinder, 2, and of ring-plate E, provided with exhaust-openings 11 and with devices for swinging and locking such plate to opposite positions for changing the positions of the exhaust-openings from one side of the abutments to the other, and thereby reversing the motion of the engine, substantially as set forth.

10. The combination of head B, with cylinder 2 and flange 3, of disk F, secured to head B, of cylinder D and reversing-plate E, both journaled upon cylinder 2, and of packing-ring G, inserted into an annular groove of flange 3, all substantially as set forth, for the purpose specified.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN A. GREGERSEN.  
ANTON G. GRAMNAS.

Witnesses:

WILLIAM H. LOTZ,  
OTTO LUBKERT.